3.0 Affected Environment and Environmental Impacts

3.1 Land Use

3.1.1 Affected Environment

Land uses in the vicinity of the proposed project include agricultural, rural residential, and a few commercial facilities along the existing ROW. About 75 percent of the land in the transmission line ROW is agricultural cropland and 10 percent is pastureland. The remaining 15 percent is residential land and natural habitat.

Agricultural uses along the transmission line ROW include crop production (field and grass seed, Christmas trees) cattle and sheep grazing, and turkey farming. On the ROW, about 193 acres are agricultural land and 26 acres are pastureland.

3.1.2 Potential Impacts of the Proposed Action

Most of the work for the proposed rebuild project would occur within BPA's existing 125-foot ROW and substation property. Additional ROW easements would only need to be purchased along three small segments of the existing ROW, and the footprint of the existing transmission line towers would generally be used for the installation of most of the new 135-foot towers. Access roads would be upgraded as required for construction. In addition, approximately 1,400 feet of new access road would need to be constructed along the existing ROW and approximately 9,700 lineal feet of access road easements on existing roads off the existing transmission line ROW would need to be acquired.

BPA has transmission line easements along the entire ROW that were acquired from private landowners. No public lands are being crossed. Fourteen danger trees would be removed.

3.1.2.1 Agricultural Lands

Potential short-term impacts to agriculture from the construction of the proposed project could include temporary and localized disruption of maintenance and/or harvest of agricultural products in actively cultivated fields where towers are replaced. Other impacts could include potential temporary and localized increases in dust, noise, soil compaction, and erosion. Although there would be some loss of crop yield in active agricultural fields due to equipment ingress and egress and staging and construction of towers, the construction would not change existing agricultural uses in the project area.

An evaluation of soil survey information for the existing transmission line ROW indicated that the majority of the ROW is located in prime farmland soils. The proposed project would be constructed mostly in an existing ROW, and mostly within existing structure footprints and would have little to no impact on area farmlands.

Mostly existing roads and rights-of-way would be used to access the transmission line towers, to dismantle the existing towers, and to construct the new towers. The only impacts

associated with the installation of the new transmission line would occur primarily at the tower pads. Once each tower site is accessed, it is estimated that a 125- by 200-foot (25,000-square-foot) to a 200- by 200-foot (40,000-square-foot) area would be used for staging and construction, and for placement of the tower foundations. Based on review of aerial photographs of the transmission line ROW, there would be approximately 85 towers replaced in agricultural fields. Assuming that these 85 towers are in actively cultivated fields and construction would result in a disturbance area of 25,000 to 40,000 square feet, an estimated 49 to 78 acres of active agricultural land could be temporarily affected by construction. This represents approximately 0.02 to 0.03 percent of all field and grass seed acreage within Marion and Linn counties, and 0.01 to less than 0.02 percent of all croplands within the counties. Replacement of the transmission line towers would have a minor to negligible effect on overall cropland production in the counties, but might have a noticeable effect on individual farmers whose lands would be affected.

Individual farmers would be compensated by BPA for any loss of crops and for post-construction activities necessary to return disturbed areas of agricultural fields to production. BPA would also employ dust abatement **best management practices** to minimize the potential for erosion (see Section 3.5.5).

Because the proposed project involves rebuilding an existing transmission line using the existing footprint and access roads in the ROW, operation and maintenance impacts would be minor and consistent with current practices. However, the increased height of transmission line towers from 70 to 135 feet could affect crop dusting in the area if this increase in height interferes with flight pathways.

3.1.2.2 Residential and Commercial Lands

There are approximately 70 to 80 buildings in the vicinity of the ROW, 17 of which are within 100 feet of the ROW. Most buildings are associated with farmsteads. Other buildings in the vicinity of the ROW include farm outbuildings and commercial facilities. These buildings would not be affected and the land use would not change.

3.1.2.3 Property Impacts

Affected landowners would be offered market value, established through the appraisal process, for the transmission line and/or access road perpetual easements. The appraisal process takes all factors affecting value into consideration including the impact of transmission lines on property value. The appraisals may reference studies conducted on similar properties to add support to valuation considerations. The strength of any appraisal is dependent on the individual analysis of the property, using neighborhood specific market data to determine market value.

Impacts to property for new rights-of-way for transmission lines and access roads are discussed below.

New transmission line right-of-way - The predominant land use for the new transmission line right-of-way consists of agricultural cropland and pastureland, with a small portion being comprised of residential and natural habitat.

BPA's transmission line easement documents encumbers the right-of-way area with land use limitations. The easement specifies, "the present and future right to clear the right-of-way and to keep the same clear of all trees, whether natural or cultivated, and all structure supported crops, other structures, trees, brush, vegetation, fire and electrical hazards, except non-structure supported agricultural crops less than 10 feet in height." The landowner may grow most crops or graze livestock. Special written agreements may be entered into between BPA and the landowner to allow Christmas, ornamental or orchard trees, and structure-supported crops. Heights of the trees/crops and access must be controlled to maintain safe distances.

The impact of introducing a new right-of-way for transmission towers and lines can vary dramatically depending on the placement of the right-of-way in relation to the property's size, shape, and location of existing improvements. A transmission line may diminish the utility of a portion of property if the line effectively severs this area from the remaining property (severance damage). Whether a transmission line introduces a negative visual impact is dependent on the placement of the line across a property as well as each individual landowners' perception of what is visually acceptable or unacceptable.

If the transmission line crosses a portion of the property in agricultural use such as pasture or cropland, little utility is lost between the towers, but 100 percent of the utility is lost within the base of the tower. Towers may also present an obstacle for operating farm equipment, and controlling weeds at tower locations. To the extent possible, new transmission lines are designed to minimize the impact to existing and proposed (if known) irrigation systems. If the introduction of a transmission line creates a need to redesign irrigation equipment or layout, BPA compensates the landowner for this additional cost.

These factors as well as any other elements unique to the property are taken into consideration to determine the loss in value within the easement area, as well as outside the easement area in cases of severance.

Market value would be paid for any timber to be cut on the new right-of-way, as well as for any trees off the right-of-way that need to be cut for construction purposes or that pose a danger of falling into the line or across the access roads.

New access roads - If BPA acquires an easement on an existing access road and the landowner is the only other user, market compensation is generally 50 percent of full fee value or something less than 50 percent if other landowners share the access road use. For fully improved roads, the appraiser may prepare a cost analysis to identify the value of the access road easement. If BPA acquires an easement for the right to construct a new access road and the landowner has equal benefit and need of the access road, market compensation is generally 50 percent of full fee value. If the landowner has little or no use for the new access road to be constructed, market compensation for the easement is generally close to full fee value.

Property Value Impacts - The proposed transmission line is not expected to have long-term impacts on property values in the area. Whenever land uses change, the concern is often raised as to the effect the change may have on property values nearby. Zoning is the primary means that most local governments use to protect property values. By allowing some uses and disallowing others, or permitting them only as conditional uses, conflicting uses are avoided. Some residents consider transmission lines to be an incompatible use adjacent to residential areas; however, this feeling is not universal.

The question of whether nearby transmission lines can affect residential property values has been studied numerous times in the United States and Canada over the last twenty years or so, with mixed results. In 1995, BPA contributed to the research when it looked at the sale of 296 pairs of residential properties in the Portland, Oregon metropolitan area (including Vancouver, Washington) and in King County, Washington. The study evaluated properties adjoining 16 BPA high voltage transmission lines (subjects) and compared them with similar property sales located away from transmission lines (comps). All of the sales were in 1990 and 1991 and adjustments were made for time and other factors. The results of the study showed that the subjects in King County were worth approximately 1 percent less than their matched comps, while the Portland/Vancouver area subjects were worth almost 1.5 percent more (Cowger et al. 1996).

BPA recently updated this earlier study using 1994/95 sales data. The sales of 260 pairs of residential properties in King County and Portland/Vancouver metropolitan areas were reviewed. The information confirmed the results of the earlier study, i.e., that the presence of high voltage transmission lines does not significantly affect the sale price of residential properties. The residential sales did, however, identify a small but negative impact from 0 to 2 percent for those properties adjacent to the transmission lines as opposed to those where no transmission lines were present. Although this study identified a negative effect, the results are similar to the earlier study and the differences are relatively small (Cowger et al., 2000).

Studies of impacts during periods of physical change, such as new transmission line construction or structural rebuilds, generally have revealed greater short-term impacts than long-term effects. However, most studies have concluded that other factors, such as general location, size of property, improvements, condition, amenities and supply and demand factors in a specific market area are far more important criteria than the presence or absence of transmission lines in determining the value of residential real estate.

As a result of the proposed project, some short-term adverse impacts on property values (and salability) might occur on an individual basis; however, these impacts would be highly variable, individualized, and unpredictable. Constructing the transmission line is not expected to cause long-term adverse effects to property values along the right-of-way or in the general vicinity. Non-project impacts, along with other general market factors, are already reflected in the market value of properties in the area. These conditions are not expected to change appreciably. Therefore, no long-term impacts to property values are expected as a result of the proposed project.

3.1.3 Potential Impacts of the No Action Alternative

The existing transmission line had a minor effect on agricultural production when the towers were installed in the early 1950s. There would be no further impacts to agriculture from the No Action Alternative other than those caused by maintenance of the existing line.

3.1.4 Cumulative Impacts

The existing transmission line had a minor effect on agricultural production when the towers were installed in the early 1950s. The proposed project would convert only a small amount of land to another use. Soil disturbance and increased vehicular traffic associated with construction

activities could increase the potential for the spread of **noxious weeds**. No future expansions or additions to the existing corridor are being considered at this time. Consultations with Linn County and Marion County planning departments have indicated that there are no recent or foreseeable developments or projects in the vicinity of the ROW that would contribute to cumulative impacts associated with the proposed project (Hopkins, May 1, 2001; Fennimore, April 21, and June 8, 2001). Cumulative impacts to land uses would be minor.

3.1.5 Mitigation for the Proposed Action

To mitigate the potential impacts identified above, the following mitigation measures would be implemented:

- Affected farmers would receive compensation for lost crop production caused by the construction of the project.
- Equipment operators and the construction crew would be instructed to close gates to avoid disturbances to livestock, and to stay within the ROW to minimize impacts to crops.
- To minimize the establishment of noxious weeds, construction crews would wash equipment and vehicles before entering construction areas.
- Marker balls would be installed on the conductor as it crosses the North Santiam River to make it more visible to pilots.
- BPA would compensate landowners to disc or till soil to reduce soil compaction from equipment once construction is completed.
- Conduct construction activities in coordination with agricultural activities.

3.2 Socioeconomics

3.2.1 Affected Environment

3.2.1.1 Population and Demographics

The population of Marion County grew from 228,438 in 1990, to 284,834 in 2000. The population of Linn County grew from 91,227 in 1990, to 103,069 in 2000. The average annual growth rate over this period was consistent with the overall growth rate for the state of Oregon during this same time period (1.5 percent). (U.S. Bureau of the Census, 1990; Portland State University Population Research Center, 2000.)

Caucasians predominate among ethnic groups in Marion and Linn counties. In Marion County, Asian and Pacific Islanders and Native Americans were the second and third most predominant ethnic groups in 2000, respectively. In Linn County, Native Americans and Asian and Pacific Islanders were the second and third most predominant ethnic group in 2000, respectively. (Portland State University Population Research Center, 2000.)

3.2.1.2 Employment, Economy, and Income

Marion County's largest employment sectors (and greatest annual earnings sectors) were services, government, and retail trade, respectively. These 3 sectors represented 23 percent, 20 percent, and 18 percent of the county's total workforce, respectively. (U.S. Bureau of Economic Analysis, 1998.) The largest employment sectors (and greatest annual earnings sectors) for Linn County in 1998 were manufacturing, services, and retail trade. These sectors represented 24 percent, 22 percent, and 17 percent of the county's total workforce, respectively. (U.S. Bureau of Economic Analysis, 1998.) The 1998 employment sector and annual earnings distributions for Marion and Linn counties were relatively similar to the state.

The unemployment rate for the state in 1999 was 5.7 percent, compared to 6.3 percent for Marion County and 8.0 percent for Linn County (Oregon Labor Market Information System, 2001).

The estimated median household income for Marion and Linn counties in 1997 was $36,853 and $36,107 respectively, which was only slightly lower than the median income for the state of Oregon in 1997 ($37,284). (U.S. Bureau of the Census 1997).

In comparison, the percentage of the population below the poverty level in 1997 for the state was 11.6 percent. In 1997, Marion County and Linn County had 13.2 percent and 12.3 percent of their populations below the poverty level. (U.S. Bureau of the Census, 1997.)

3.2.2 Potential Impacts of the Proposed Action

Transmission line construction requires skilled labor and equipment that are unique; therefore the prime contractor for the project would likely come from outside the local area (e.g., from the Seattle or Portland areas). Construction workers would earn wages averaging about $38 per hour, depending on the trade and level of responsibility.

Construction of the transmission line is expected to begin in May 2002 or 2003 with the line being energized in November of the same year, a construction period of approximately 6 months. The work force required for construction would vary over the 6-month period ranging from approximately 18 workers in the initial and final stages of construction to approximately 33 workers during the peak of construction activities.

Depending on where the transmission line workers reside and whether construction would involve a 5-day or 6-day work week, the construction crews would typically stay in the area until the project is completed. Construction workers would either stay in temporary housing (motels/hotels) or bring their own accommodations (recreational vehicles) and stay in recreational vehicle (RV) parks or campgrounds. These facilities are available in the area. Because of the limited number of workers (approximately 18 to 33) and the short duration of the construction project (approximately 6 months), impacts on the commercial lodging industry in the area would be minor. Overall, the short-term construction impacts would be considered beneficial to the local economy. The proposed project would create a minor increase in employment and spending in the local economy over the short term.

The proposed project would not create any long-term impacts on the region's population because the project would not induce growth. There would be no long-term impacts on housing.

Operation and maintenance of the line would continue to be under the purview of BPA. Normal maintenance would involve brush clearing by a BPA contractor, ordinarily performed every 5 years. This employment impact would be low because it would not contribute to a significant increase of employment in either county.

3.2.3 Potential Impacts of the No Action Alternative

The No Action Alternative assumes that no transmission facilities would be replaced. Not replacing these facilities could result in more outages for BPA customers and potentially increased maintenance costs (in both time and materials) to keep the existing line in operation.

3.2.4 Cumulative Impacts

The existing transmission line had a minor effect on the local economy when it was built in the early 1950s. No future expansions or additions to the existing corridor are expected at this time. Cumulative impacts on the population or economy of the region would be minor.

3.2.5 Mitigation for the Proposed Action

No mitigation measures are required to address socioeconomic impacts of the project because there would be no in migration or impacts on housing, and there would be a somewhat positive impact on the local economy through project employment and expenditures.

3.3 Visual Resources

Construction activities with potential visual impacts include removal of the existing 70-foot steel towers, installation of the 135-foot towers, the stringing of conductor wires, and the upgrading of access roads. The potential long-term visual impacts would result from a change in the visual appearance of the transmission line after the replacement of the 70-foot towers with 135-foot steel towers.

The methodology used to assess the visual resources and visual impacts of the proposed project generally conforms to the Visual Management System developed by the U.S. Forest Service, and the Visual Resource Inventory developed by the Bureau of Land Management. Topography, vegetation (size and shape), and developed land uses were reviewed using U.S. Geological Survey (USGS) quadrangle maps, aerial photos, photographs, and project maps. Field reconnaissance and a helicopter survey were conducted to determine the general visibility of the existing transmission line from sensitive viewpoints (e.g., residences, travel routes, parks, and public areas).

Potential visual impacts resulting from the proposed project were evaluated by assessing the visual quality of the project area, viewer sensitivity, the degree of visual changes from the existing environment, and the visibility of changes from the sensitive viewpoints.

Visual quality in the project area was assessed using the following descriptions:

- **Urban/developed landscapes.** These are common to urban areas and urban fringes. Human elements in such landscapes are prevalent and certain landscape modifications may exist that do not blend with the natural surroundings.
- **Rural landscapes.** These landscapes exhibit reasonably attractive natural and human-made features/patterns, although they are not visually distinctive or unusual within the region. The landscape provides positive visual experiences such as the presence of natural or open space interspersed with existing agricultural areas (farm fields, etc.).
- **Scenic/distinctive landscapes.** These exhibit distinctive and memorable visual features (e.g., landforms, rock outcrops, streams/rivers, scenic vistas) and patterns (vegetation, open space) that usually occur in an undisturbed rural setting but may also be found in an urban setting.

Viewer sensitivity in this evaluation is described as a combination of viewer type, viewer exposure (number of viewers and view frequency), view orientation, view duration, and viewer awareness/sensitivity to visual changes.

Indoor workers (i.e., at the meat packing plant) in the project area were considered to have low visual sensitivity, since most of their activities are typically indoors. Highway and local travelers crossing or coming close to the transmission ROW and agricultural and other workers in the vicinity were considered to have moderate visual sensitivity. Although travelers and local workers in the project vicinity would frequently view the proposed project facilities, they would be focused on driving or work activities with short-term visual exposure. Residential and recreational viewers were considered to have moderate to high visual sensitivity, depending on their proximity to and visibility of the project area. These viewers would have a longer period of visual exposure.

3.3.1 Affected Environment

The proposed project would take place within an approximately 125-foot-wide transmission ROW that has existed since 1953.

Beginning at the Santiam Substation (mile 1) and continuing to the Marion Substation (mile 3), the existing transmission ROW contains two transmission lines supported on steel lattice towers (including Santiam-Chemawa), and several smaller power lines on wood poles intersect the transmission lines. The existing transmission line exits the Marion Substation and is intersected by telephone and electrical transmission lines in 15 locations. A PGE 230-kV transmission line crosses the existing transmission line in mile 9 and mile 17. The existing BPA ROW crosses through rolling hills and flat lands used for agriculture, interspersed with small, forested patches and occasional drainage courses. The background along the route varies between tree-covered hills and the Cascade Mountain foothills. Rural development (mainly farmsteads) and some commercial development (e.g., manufacturing facilities, commercial farms) occur intermittently along the ROW. Because the transmission line has existed since the early 1950s, it has been a part of the viewscape in the project area for nearly 3 generations.

3.3.2 Potential Impacts of the Proposed Action

The greatest visual exposure to the proposed transmission line upgrade within the existing electrical transmission ROW would be from the approximately 70 to 80 residences and farmsteads located intermittently along the ROW; the Fitzmaurice Fertilizer Company in the vicinity of mile 9; and the Bruce Pac Meat Plant and Doerfler Farms in the vicinity of miles 9 and 10.

The visual impact from the proposed project to these potential viewers is considered low to moderate, based on the following:

- The proposed rebuild would occur within an established electrical transmission line ROW that is close to these potential viewers. These viewers already have decreased sensitivity to the visual components associated with the proposed project including operation and maintenance activities.
- The construction activities associated with the rebuild would be of limited duration and would be widely spaced.
- Although different in appearance (taller towers) from the existing transmission line, the rebuild would be visually similar. Views of the rebuilt line would blend in with or be partially screened by trees, landscaping, hilly terrain, and other buildings along the route.

There are 14 areas along the existing ROW where travelers could be visually exposed to the transmission line either from roads crossing under or coming close to the ROW. The potential visual impact to these travelers is considered low for the same reasons as stated above. In addition, the duration of exposure would be limited as travelers passed under or close to the transmission line and their attention would be focused on driving.

For the remainder of the existing ROW, there would be minimal potential visual impacts because there is limited exposure to potential viewers, and the transmission line crosses areas that are visually less sensitive.

3.3.3 Potential Impacts of the No Action Alternative

No visual impacts are expected to occur beyond those already occurring from the existing transmission line.

3.3.4 Cumulative Impacts

The existing transmission line had an effect on visual resources when the towers were installed in the early 1950s. The addition of taller towers would create a range of visual effects from low to moderate, depending on the sensitivity of the viewer. No future expansion or additions to the existing ROW are anticipated at this time.

3.4 Recreation

3.4.1 Affected Environment

There are no formal recreational facilities immediately next to the existing transmission line ROW in Marion or Linn counties.

3.4.2 Potential Impacts of the Proposed Action

No or minor impacts on recreation are expected during construction of the proposed project. No formal recreational facilities exist in the immediate vicinity of the project site. Deer and upland bird hunting in the surrounding area and fishing on the North Santiam River and some of the smaller creeks may be interrupted temporarily in the vicinity of the project during construction.

No long-term operation and maintenance impacts on recreation are anticipated because the project would not directly affect the facilities. However, the 130-foot transmission towers would be more visible then the existing 70-foot transmission towers and might have a slightly greater negative aesthetic effect on the users' recreational experience in the area.

3.4.3 Potential Impacts of the No Action Alternative

No impacts to recreation are expected beyond those already occurring from the existing line.

3.4.4 Cumulative Impacts

The existing transmission line had a minor effect on recreation when the towers were installed in the early 1950s. The proposed project would introduce taller towers into a rural setting sometimes used for recreation.

3.5 Soils and Geology

3.5.1 Affected Environment

The ROW is located on the west side of the Cascade Range within the Willamette Valley physiographic province. Elevations in the project vicinity range from 200 feet near the tap to about 900 feet maximum in mile 4. Within much of the project area, soils have formed on gently sloping low foothills and nearly level stream terraces and are well- to moderately well-drained. Soils on the foothills have formed in materials derived from basalt and compacted volcanic fragments. Stream terrace soils have developed in silty alluvium of mixed origins, which were deposited by past stream actions.

3.5.2 Potential Impacts of the Proposed Action

Soils denuded of vegetation or disturbed by construction activities are more susceptible to erosion. An increase in erosion can reduce soil productivity and degrade water quality. The amount of soil erosion caused by construction is a function of soil properties, slope, vegetation, rainfall patterns, and construction practices. The potential for erosion is slight throughout the project area except in areas where the slope is approximately 7 percent or greater, and in the 100-year floodplain of the North Santiam River. The potential hazard of soil erosion is moderate in these areas.

Impacts would be primarily related to disturbances associated with tower construction, conductor-stringing operations, clearing to provide access to work areas, and road improvements. Impacts would include localized increases in erosion and runoff rates at construction sites. Heavy equipment could also compact sites, reducing soil productivity. Impacts would be greatest during and immediately after construction until the disturbed sites have been revegetated. Revegetation and rehabilitation of compacted sites would reduce runoff and erosion rates to near pre-construction levels. Changes in localized runoff and erosion patterns at structure sites or where access roads have been built or modified are possible long-term impacts. Because the proposed project involves rebuilding an existing transmission line using the existing footprint and access roads in the ROW, operation and maintenance impacts would be minor and consistent with current practices.

3.5.3 Potential Impacts of the No Action Alternative

Because no grading or road maintenance would occur, there would be no impacts to earth resources other than those already occurring from the existing line.

3.5.4 Cumulative Impacts

Past, current, and future land development activities, including forest and agricultural management practices, could increase erosion and introduce sediment into surface waters. The Proposed Action would be constructed to prevent interference with any ongoing conservation efforts to control erosion and maintain water quality. Although minor, localized increases in erosion, runoff, and sedimentation are expected from construction and maintenance, these increases would have a low short-term impact on the area's soil resources and water quality. The Proposed Action would not further impair the current or future beneficial use of land or water resources.

3.5.5 Mitigation for the Proposed Action

Minimizing disturbance and erosion is a concern at all transmission tower erection sites, construction staging areas, and where access roads would be modified or improved. By following best management practices, impacts would be reduced or eliminated at all sites and would be short term. Best management practices include these mitigation measures:

- Design roads to control run-off and prevent erosion.

- To minimize erosion, disturbed areas would be returned to their original contour and promptly seeded with a seed mixture suited to the site.
- Sediment barriers and other suitable erosion control devices would be installed where needed to minimize movement of sediment.
- When practical, construction activities would be avoided when soil is wet to reduce soil compaction, rutting, and the resultant loss in soil productivity.
- Farm operators would be assisted in restoring productivity of compacted soils.
- Water trucks would be used on an as-needed basis to minimize dust.

3.6 Vegetation

3.6.1 Affected Environment

The proposed project is located within an existing electrical transmission ROW in habitats that are predominantly nonforested. Over 75 percent of the vegetation cover within the ROW is agricultural field. An additional 10 percent is pastureland. Approximately 3 percent of the ROW is wetland. Vegetation cover in the remaining 12 percent of the ROW includes mixed Douglas fir and Oregon oak woodlots, abandoned agricultural fields, and rural residential lands.

The prevalent habitat within the ROW is agricultural. The project is located within a portion of the Willamette Valley where grass seed production predominates. Other cover types within the ROW include low shrubs, such as Scot's broom, emergent wetlands, scrub-shrub wetlands dominated by willows and Pacific ninebark, and heavily disturbed, frequently-mowed weedy vegetation.

There are 29 waterway crossings (i.e., drainage ditch, stream) in the project area. These waterways crossing the ROW provide aquatic habitat. Some of the wetland and terrestrial habitats have value to wildlife; all are common in Marion County and neighboring Willamette Valley areas.

3.6.2 Potential Impacts of the Proposed Action

Ground surface and vegetation disturbance during construction of the new transmission line could increase the presence of weedy, non-native vegetation in the ROW, primarily Scot's broom and Himalayan blackberry. However, with the use of the mitigation measures described in Section 3.1.5, the potential impacts from these non-native species are considered low. Because the proposed project involves rebuilding an existing transmission line using the existing footprint and access roads in the ROW, operation and maintenance impacts would be minor and consistent with current practices.

3.6.3 Potential Impacts of the No Action Alternative

The No Action Alternative would continue vegetation maintenance and clearing to maintain the ROW. BPA standard management practices, which are defined in the Transmission System Vegetation Management Programmatic Environmental Impact Statement (DOE/EIS-0285, June 2000), would be applied to avoid or minimize potential impacts to vegetation.

> The Vegetation Management Programmatic Environmental Impact Statement is available at: http://www.efw.bpa.gov/cgi-bin/PSA/NEPA/SUMMARIES/VegetationManagement_EIS0285.

3.6.4 Threatened and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) has identified two federally-listed endangered and four federally-listed threatened plant species with potential to occur in the project area (McMaster, October 27, 2000) (see Table 2). There are documented occurrences of the 2 federally-listed species in a portion of the project area. These are Willamette daisy (*Erigeron decumbens* var. *decumbens*) and Bradshaw's lomatium (*Lomatium bradshawii*).

The Oregon Natural Heritage Program recorded a Willamette daisy population and a Bradshaw's lomatium population near mile 7 within the project area in 1997. A **palustrine emergent wetland** is found in this area. The periphery of the wetland, in the transition area to upland, provides potential habitat for the Willamette daisy. Those portions of the wetland that are moist to saturated, but not inundated, provide potential habitat for the Bradshaw's lomatium. A survey of the documented occurrence area near mile 7 determined that there is potential habitat present.

3.6.5 Cumulative Impacts

The existing transmission line had an effect on vegetation when the towers were installed in the early 1950s. There are no other ongoing or planned activities along the ROW being considered at this time. Should additions or expansions in the ROW or adjacent areas be planned, the activities could create additional impacts to vegetation.

3.6.6 Mitigation for the Proposed Action

The principal potential impacts to native vegetation include disturbance or modification of potential habitat, accidental spread of non-native plant species, and accidental spills of petrochemicals. BPA would include the following mitigation measures to avoid and minimize potential impacts of the project to native vegetation including federally-listed plant species.

- To avoid disturbance to areas of native vegetation, BPA would limit construction from potential habitat for these species and limit construction equipment to previously disturbed areas.

- To avoid spreading noxious weeds, vehicles would be washed before they enter the project area. Disturbed nonagricultural areas would be reseeded with a plant mix, fertilized, and mulched.

Table 2 – Federally-Listed Species

Species	Status	Occurrence in ROW
Willamette daisy (*Erigeron decumbens)*	TE	Documented
Bradshaw's lomatium (*Lomatium bradshawii)*	LE	Documented
Nelson's checker-mallow (*Sidalcea nelsoniana)*	LT	No Documented Populations
Kincaid's lupine (*Lupinus sulphureus)*	LT	No Documented Populations
golden paintbrush (*Castilleja levisecta)*	LT	No Documented Populations
water Howellia (*Howellia aquatillis)*	LT	No Documented Populations
Notes: LT = Federally-Listed Threatened; LE = Federally-Listed Endangered Sources: U.S. Fish and Wildlife Service Oregon State Office, October 27,2000.		

3.7 Fish and Wildlife

3.7.1 Affected Environment

The proposed project is located within the Western Interior Valleys Province of Oregon, as described in the Oregon Wildlife Diversity Plan (ODFW, 1993). Wildlife habitats in this province have been altered by human development and conversion of native habitats to agriculture. Habitats that exist within and next to the ROW include riparian areas containing second growth coniferous forest, coniferous forest mixed with hardwoods, and grass and herbaceous vegetation; and upland areas containing second growth coniferous forest, second growth coniferous forest mixed with Garry oak, and areas of grasses and herbaceous vegetation. However, most of the area (75 percent) within and adjacent to the ROW contains agricultural fields.

Wildlife species common to the area that have adapted to human development include opossum, scrub jay, house finch, brown-headed cowbird, and Anna's hummingbird. Other species that may occur in the project area include acorn woodpecker, grasshopper sparrow,

Lewis's woodpecker, red-tailed hawk, northern harrier, American kestrel, western bluebird, black tailed jack rabbit, mule deer, and several species of bats including little brown myotis, Yuma myotis, California bat, silver haired bat, big brown bat, and hoary bat (ODFW, 1993; Maser, 1998).

Of these, the Lewis's woodpecker is considered sensitive in Oregon. Both the acorn woodpecker and Lewis's woodpecker are strongly associated with oak habitat, and the Lewis's woodpecker is also associated with riparian habitat. Oak habitat occurs in the project area outside of the ROW both within and outside of riparian zones.

The project is within the Molalla-Pudding River and North Santiam River basins, which drain into the Willamette River, a tributary of the Columbia River. The Molalla-Pudding River Basin consists primarily of forest riparian and agricultural/urban riparian land types and has a watershed area of approximately 887 square miles. The North Santiam River Basin consists primarily of forest riparian and agricultural/urban riparian land types and has a watershed of approximately 767 square miles. There are 29 waterway crossings (i.e., drainage ditch or stream crossings) in the project area. Major drainages crossed by the ROW include the North Santiam River, Alder Creek, Valentine Creek, Mill Creek, and Beaver Creek. Streams vary in width from approximately 150 feet (North Santiam River) to 1 to 2 feet. Most streams are low gradient (1 to 2 percent) with **substrate** consisting primarily of fine sediment. Smaller streams are in many cases seasonal, and some are seeps that are associated with wetlands.

The riparian corridor varies from a width of 0 to 100 feet throughout the project area. Fish species that could use the waterways in the project vicinity include chinook salmon, cutthroat trout, steelhead, Pacific lamprey, Oregon chub, speckled dace, rainbow trout, and mountain whitefish. Most of the streams provide winter refuge habitat with some salmonid spawning habitat in the North Santiam River and below the project area in Mill Creek.

All stream or river reaches assessable to chinook or coho salmon in the project area are considered **essential fish habitat** (EFH) for these species. The proposed transmission line would span all rivers and streams.

3.7.2 Potential Impacts of the Proposed Action

Potential impacts to wildlife would primarily occur within the ROW. The exception to this is that species sensitive to human activity may be temporarily displaced from habitats adjacent to the project area during construction. Removal of danger trees within or next to the ROW may result in a minor reduction of wildlife habitat available.

Species expected to be found most commonly in the project area are not sensitive to human disturbance, and many have adapted to existing with humans. Bats potentially occurring in the project area may be sensitive to human disturbance in the vicinity of roosting or hibernating sites or maternity colonies, which may occur in buildings, caves, or large, hollow trees. Danger tree removal may result in a minor reduction in the amount of bat roosting, hibernating, or maternity habitat if the trees felled are hollow or have loose bark that a bat can roost under.

Removal of danger trees may also result in a minor reduction in habitat available for cavity nesting bird species such as American kestrel, western bluebird, and both acorn and Lewis's woodpecker. One oak tree would be removed as a danger tree outside of the ROW. Removal of

one tree would not alter the character of the habitat for woodpecker species potentially occurring in the area.

Potential habitat removal would be limited to individual trees and would not greatly alter the amount of habitat available for wildlife species expected to occur in the project area. In addition, potential noise disturbance to species sensitive to human activity would be localized and temporary. As a result, impacts of the proposed project are expected to be minor.

Potential adverse impacts to fish that may occur with the proposed project include the following:

- Culvert installation, road rocking, replacing towers, and clearing of danger trees could potentially result in a temporary increase in sediment delivery and turbidity to adjacent waterways. About 15 culverts would be installed in waterways (6 in agricultural drainage ditches, 5 in road ditch lines, and 4 in streams). If fish are present in these waterways at the time of construction, increased turbidity could result in temporary displacement, reduced feeding efficiency, or injury.
- As with any construction project, there is a slight potential for accidental spills of petroleum products.
- Clearing of danger trees could potentially result in a slight decrease in riparian function along the North Santiam River and an unnamed tributary to Beaver Creek. However, the five cottonwood trees to be removed south of the North Santiam River are approximately 250 feet from the river and removal of these tress would have a very minor to no effect on riparian function.

With the mitigation measures proposed for this project, potential impacts to fish would be minor. Because the proposed project involves rebuilding an existing transmission line using the existing footprint and access roads in the ROW, operation and maintenance impacts would be minor and consistent with current practices.

3.7.3 Potential Impacts of the No Action Alternative

The No Action Alternative would continue vegetation maintenance and clearing to maintain the ROW. BPA standard management practices, which are defined in the Transmission System Vegetation Management Environmental Impact Statement (DOE/EIS-0285, June 2000), would be applied to avoid or minimize potential impacts to wildlife and fish.

3.7.4 Threatened and Endangered Species

The National Marine Fisheries Service (NMFS) and USFWS have identified one federally-listed endangered fish species (Oregon chub) and two federally-listed threatened fish species (Upper Willamette River chinook salmon and Upper Willamette River steelhead **evolutionarily significant units** [ESUs]) as potentially occurring in the project area. (See Table 3.) Based on information supplied by the Oregon State Department of Fish and Wildlife, the creeks in the project area have the potential to support chinook salmon and steelhead. According to the Natural Heritage Map (2001), chinook salmon and steelhead occupy the North Santiam River, Mill Creek, Beaver Creek, and the Pudding River. Critical habitat has been designated within

the project area for the Upper Willamette River chinook salmon ESU and the Upper Willamette River steelhead ESU. Specifically, juveniles of these two salmonid species probably use the waterways during winter flows for refuge habitat (Hunt, April 30, 2001).

Oregon chub are known to use some areas of the lower North Santiam River (Hunt, April 30, 2001). However, there are no identified populations of Oregon chub in the vicinity of the project.

The Upper Willamette River Basin has been identified as EFH for chinook and coho salmon. Because of the low level of earth disturbing activities and the mitigation measures included in the project (see Section 3.7.6), BPA has determined that the project would also not adversely affect EFH for chinook or coho salmon.

Table 3-Federally-Listed Species

Species	Status	Occurrence in ROW
Oregon chub	LE	No Documented Populations
Upper Willamette River chinook salmon	LT	Documented
Upper Willamette River steelhead	LT	Documented
bald eagle	LT	No Documented Populations
northern spotted owl	LT	No Documented Populations
Fender's blue butterfly	LE	No Documented Populations
Notes: LT=Federally-Listed threatened; LE=Federally-Listed endangered Sources: U.S. Fish and Wildlife Services Oregon State Office, October 27, 2000; Oregon Department of Fish and Wildlife, April 30, 2001		

Three other species listed as threatened or endangered by the USFWS could potentially occur in the project area: bald eagle, northern spotted owl, and Fender's blue butterfly. However, none of these species have been documented in the project area. (See Table 3.)

Potentially suitable perching or roosting habitat for bald eagles occurs next to the ROW where it crosses fish bearing streams, including the North Santiam River and Mill Creek.

Since forested areas adjacent to the ROW are second or third growth Douglas fir mixed with Garry oak, there is no suitable nesting or roosting habitat for northern spotted owls in the project area. This forested habitat could provide dispersal habitat for northern spotted owls; however, it is unlikely that they would use this area since the forested habitat is highly fragmented, occurs in small patches, and does not provide the continuous cover preferred by dispersing northern spotted owls.

One area of native upland vegetation has been identified within and adjacent to the ROW. This area may provide habitat for Fender's blue butterfly, though neither the butterfly nor its

known host plant, Kincaid's lupine (*Lupinus sulphureus kincaidii*), have been documented in this location.

3.7.5 Cumulative Impacts

The existing transmission line had an effect on fish and wildlife when the towers were installed in the early 1950s. There are no other ongoing or planned activities along the ROW being considered at this time. Should additions or expansions in the ROW or adjacent areas be planned, the activities could create additional impacts to fish and wildlife.

3.7.6 Mitigation for the Proposed Action

The principal potential impacts of the proposed project to aquatic species include delivery of fine sediment to streams from culvert installation, road rocking, tower assembly and erection, clearing to provide access to work areas, and accidental release of petrochemical contaminants to surface waters during project construction. Mitigation measures to be used under the proposed project seek to avoid or minimize all of these impacts.

The potential for these activities to affect salmonids (via runoff from the construction site) would be avoided or minimized through a number of mitigation measures that include limiting activities to existing access areas, establishing construction and vehicle maintenance setbacks from surface waters, using erosion and sediment control measures (silt fences, weed-free straw check dams, straw mulch), and reseeding disturbed areas. In addition to the mitigation measures noted above, BPA would implement the following measures to avoid and minimize potential impacts to aquatic species.

- To reduce disturbance to soils and vegetation, vehicle use would be restricted to access roads and some areas around and between towers, and topsoil would be left in roughened condition except in road shoulders.
- Erosion would be minimized by seeding disturbed nonagricultural areas with a plant seed mix, preferably in October or November.

To avoid the delivery of fine sediment to streams, the following measures would be used:

- Roadway drainage systems would be designed to control and disperse runoff (e.g., using outsloping roads, water bars, and ditches) to prevent erosion or slope stability problems.
- Erosion control measures such as silt fencing, straw mulch, straw bale check dams, and reseeding disturbed areas would be used to contain sediment within work areas. Special erosion control fabrics, such as matting, would be applied where soils and slopes have high erosion potential. In areas where towers are adjacent to waterways (miles 5, 7, 9, 10, 12, and 14), special erosion control fabrics, such as matting, would be applied to minimize erosion potential and sediment input to the streams.
- Access roads would be rocked where necessary.
- To the degree practical, construction would be avoided during wet weather to reduce rutting and soil loss.

- With the exception of the installation of culverts along unnamed tributaries to Valentine and Mill creeks and an unnamed tributary to the Pudding River, no construction activities would occur in water.
- All culvert installations in fish-bearing streams would be designed to be consistent with Oregon Department of Fish and Wildlife (ODFW) fish passage criteria (ODFW, 1997). When possible, all work would occur in dry conditions. All work that must be performed in flowing water would be completed during ODFW in-water work periods for the specific drainages or as negotiated with ODFW. All culvert installations would occur on waterways that are not identified stream reaches with threatened and endangered fish species. Any direct effect would consist of short-term turbidity due to construction activity, which would minimally affect fish downstream with work performed within the in-water work window and by implementing conservation measures to minimize any potential effects.

3.8 Wetlands

3.8.1 Affected Environment

Wetlands are transitional areas between well-drained uplands and permanently flooded aquatic habitats. Many wetlands are highly productive and support numerous complex food chains that represent valuable sources of energy to plants and animals. In addition, wetlands provide general and specialized habitat for a wide variety of aquatic and terrestrial animals. Many species depend upon wetlands for all or part of their life cycles (Mitsch and Gosselink, 1993).

Wetlands along the Santiam-Chemawa transmission line ROW were identified using National Wetland Inventory (NWI) maps, aerial photographs of the ROW, and field visits. A total of 14 wetlands were identified within the cleared ROW.

The 14 wetlands identified were classified into 3 wetland vegetation communities: **palustrine forested**, palustrine emergent, and **palustrine scrub-shrub**. Palustrine forested wetlands are characterized by woody vegetation that is 20 feet or more in height (Cowardin et al., 1979).

Palustrine emergent wetlands are shallow freshwater wetlands. They are characterized by erect, rooted, herbaceous hydrophytes (water-loving plants). In areas with relatively stable climatic conditions, emergent wetlands maintain the same appearance perennially (Cowardin et al., 1979).

Palustrine scrub-shrub wetlands are dominated by woody vegetation less than 20 feet tall. This vegetation includes true shrubs, young trees, and trees and shrubs that are small or stunted because of environmental conditions. Scrub-shrub wetlands may represent a successional state of a forested wetland, or may be relatively stable communities (Cowardin et al., 1979).

3.8.2 Potential Impacts of the Proposed Action

The existing ROW has been disturbed by the original construction of the Santiam-Chemawa transmission line and by ongoing maintenance. The ROW has been previously cleared of trees for the transmission line towers. Towers for the new transmission line would be constructed within the footprint of the existing towers. With the mitigation measures proposed for this project, any potential impacts to wetlands are considered minor because the project activities would not permanently affect wetland functions.

3.8.3 Potential Impacts of the No Action Alternative

This alternative would not require any construction, clearing, or new access. No impacts to wetland resources would occur beyond those already incurred from the existing line.

3.8.4 Cumulative Impacts

The existing transmission line had an effect on wetlands when the towers were installed in the early 1950s. There are no other ongoing or planned activities along the ROW being considered at this time. Should additions or expansions in the ROW or adjacent areas be planned, the activities could create additional impacts to wetlands.

3.8.5 Mitigation for the Proposed Action

To avoid and minimize potential impacts to wetlands in the project area, the following mitigation measures would be implemented:

- There would be no filling in wetlands without a permit from the U.S. Army Corps of Engineers.
- Topsoil would be immediately replaced following construction.
- Silt fencing would be placed between construction areas and sensitive resources to prevent sedimentation of those resources.
- Vehicles would be washed before entering the project area to avoid the spread of noxious weeds.
- Weed-free hay bales would be used for erosion control.
- All disturbed soils would be seeded following completion of construction.
- Construction equipment would be placed (stored) at least 150 feet from wetlands where possible.
- Construction equipment would be kept out of wetlands where possible.

3.9 Floodplains

3.9.1 Affected Environment

According to the Federal Emergency Management Agency (FEMA) flood hazard maps, the ROW crosses the 100-year floodplains of the Santiam River and a tributary to the Pudding River. The existing transmission line has not increased the potential for flooding or otherwise affected floodplain function.

3.9.2 Potential Impacts of the Proposed Action

Floodplain Management Executive Order 11988 mandates adverse impacts to floodplains must be avoided whenever there is a practical alternative. Where no practical alternative is available, impacts must be minimized.

One tower would be replaced on the north side of the North Santiam River within the 100-year floodplain. Two towers would be replaced at the edge of the 100-year floodplain of a tributary to the Pudding River. One would be located at the southeast edge of the floodplain; the other would be located at the northwest edge.

With the mitigation measures proposed for this project, any potential impacts to floodplains are considered minor because project activities would not affect floodplain function.

3.9.3 Potential Impacts of the No Action Alternative

This alternative would not require any construction or new access. No impacts to floodplains would occur beyond those already incurred from the existing line. Operation and maintenance impacts would be minor and consistent with current practices.

3.9.4 Cumulative Impacts

The existing transmission line did not affect floodplain function. There are no other ongoing or planned activities along the ROW being considered at this time. Should additions or expansions in the ROW or adjacent areas be planned, the activities could create additional impacts to the floodplain.

3.9.5 Mitigation for the Proposed Action

To avoid and minimize potential impacts to floodplains in the project area, the following mitigation measures would be implemented:

- All construction and clearing debris would be removed from within the floodplain boundary.
- To avoid delivering fine sediment into the stream channel, erosion control measures, including placement of silt fences and straw bales, revegetation and other stabilization measures would be used during construction.

3.10 Water Quality

3.10.1 Affected Environment

Marion and Linn counties lie within the Willamette Valley. Annual precipitation averages approximately 40 inches. Temperatures range from an average of 40°F to 67 °F. The project is within the Molalla-Pudding and North Santiam River basins.

Groundwater is used for domestic, agricultural, and industrial uses. The North Santiam and Molalla-Pudding River basins are part of the Puget-Willamette trough regional aquifer system (USGS, 2000a). The main source of groundwater within the North Santiam River Basin is the Miocene basaltic-rock aquifer, which underlies 100 to 200 feet of unconsolidated deposits of sand and gravels and is considered the most productive aquifer within the Puget-Willamette trough regional aquifer system. The main aquifer source for groundwater in the Molalla-Pudding River Basin is the Puget-Willamette Lowland Aquifer System (USGS, 2000b).

Both the Molalla-Pudding and North Santiam River basins are considered Priority 1 on Oregon's 1998 Section 303(d) list (Oregon Department of Environmental Quality, 1998a) of water-quality-limited waterbodies for temperature (Oregon Department of Environmental Quality, 1998b). The Pudding River is also listed because of the presence of bacteria and DDT (Oregon Department of Environmental Quality, 1998b).

3.10.2 Potential Impacts of the Proposed Action

Potential impacts to water quality from the proposed project are expected to be minor. Culvert installation, road rocking, tower assembly, and clearing of danger trees could potentially result in the delivery of fine sediment to streams, which could potentially result in temporarily increases in turbidity.

Hazardous materials associated with the project would be limited to substances commonly associated with construction equipment. This includes gasoline, diesel fuels, and hydraulic fluids. As with any construction project, there is a slight potential for accidental spills of petroleum products. The potential for these activities to affect water quality (via runoff from the construction site) would be avoided or minimized through a number of conservation measures.

Construction of the proposed project would not exacerbate existing water quality limitations in the Santiam or Pudding River drainages. Danger tree removal would not greatly affect temperature in these drainages and would not contribute bacteria, DDT, or other pollutants to surface waters.

Construction and operation of the double-circuit lines are not expected to affect groundwater quality. Shallow aquifers could experience minor short-term disturbances from changes in overland water flow and recharge caused by clearing and grading along the existing ROW. Near-surface soil compaction caused by heavy construction vehicles could reduce the soils' ability to absorb water. However, these impacts are not likely, as the access would be temporary and would occur primarily in agricultural fields where the land is plowed frequently as new crops are planted. Any minor impacts that could occur would be temporary.

3.10.3 Potential Impacts of the No Action Alternative

No impacts to water quality are expected to occur beyond existing conditions.

3.10.4 Cumulative Impacts

The proposed project is not expected to result in any cumulative effects on water quality. There are no known plans for nonfederal projects in the vicinity of the project that could affect water quality within the ROW. The project lies within agricultural and rural areas that are not likely to be developed in the foreseeable future.

3.10.5 Mitigation for the Proposed Action

Mitigation measures to avoid or minimize potential temporary effects to water quality are the same as those identified for vegetation, fish and wildlife (see Sections 3.6.6 and 3.7.6).

To avoid accidental release of petrochemical contaminants to surface waters, the following measures would be used:

- Mechanized equipment would be stored and maintained at least 150 feet from any surface water (stream or wetland).
- Mechanized equipment would be inspected daily for leaks and promptly repaired or replaced if leaking.
- A stormwater pollution prevention plan would be prepared and implemented.

3.11 Cultural Resources

3.11.1 Affected Environment

In the Willamette Valley two broad culture-historical stages are generally identified, the Paleoindian and the Archaic. The first refers to the earliest widely-recognized culture in the Americas. Paleoindian groups were probably nomadic or hunter-gatherers. The Archaic extends from 8000 B.P. (before present) to 200 B.P. and is characterized by a subsistence pattern that emphasized broad-based hunting with secondary emphasis on gathering (Minor et al., 1982). Groups in the study area and vicinity at the time of European contact include the Santiam band of the Kalapuya Indians, one of about 13 autonomous Kalapuya bands. Kalapuyan groups at the time of Euroamerican contact occupied all of the Willamette Valley from Willamette Falls (at present-day Oregon City) to the northern part of the Umpqua Valley. The Santiam and other Kalapuya bands were composed of a number of winter-village groups that shared a language dialect. Kalapuyan subsistence relied heavily on plant foods and game of all types.

In the early 1830s, retiring Hudson's Bay Company employees began to settle on the prairies along the Willamette River where they had previously trapped. Missionaries and the

early pioneer immigrants soon followed these early settlers in present-day Marion County. With the first settlements came mills, warehouses, roads, and ferry landings.

Howell Prairie, on the north end of the project area, was attractive to emigrants traveling west on the Oregon Trail who considered it suitable for diversified farming and stock raising. Howell Prairie was likely the result of Native American burning practices that facilitated open-game hunting grounds. With the arrival of other settlers on the Prairie in the 1840s, this location is considered one of the earliest agriculturally developed areas in the Willamette Valley.

3.11.2 Potential Impacts of the Proposed Action

A cultural resource survey that included background literature and cartographic research and an archaeological field study of the Proposed Action was completed in May 2001. No prehistoric or historic-period archaeological sites have been recorded within a one-mile radius of the Proposed Action. An examination of General Land Office maps dating between 1852 and 1863 indicated that the Santiam-Chemawa transmission line crosses at least 22 Donation Land Claims (DLC) and that the ROW passes through or near two homesteads dating from 1855. No historic-period artifacts or features were observed at these sites. Shovel test probes also did not yield any historical artifacts. No archaeological or historical materials were observed on the ground surface at any of the tower locations or within the ROW between the towers. One prehistoric artifact was recovered from a shovel test probe within the footprint of one of the towers; however, the single artifact does not represent a cultural resource potentially eligible for listing in the National Register of Historic Places.

Based on existing evidence, BPA has made a determination that the Proposed Action would not affect archaeological or historic resources. Because the proposed project involves rebuilding an existing transmission line using the existing footprint and access roads in the ROW, operation and maintenance impacts would be minor and consistent with current practices. The Oregon State Historical Preservation Officer (SHPO) is reviewing this determination. BPA will not conclude this environmental process until it receives the SHPO's concurrence with the determination.

3.11.3 Potential Impacts of the No Action Alternative

No impacts from the No Action Alternative are expected.

3.11.4 Cumulative Impacts

The existing transmission line had an effect on cultural resources when the towers were installed in the early 1950s. There are no other ongoing or planned activities along the ROW being considered at this time. Should additions or expansions in the ROW or adjacent areas be planned, the activities could create additional impacts to cultural resources.

3.11.5 Mitigation for the Proposed Action

No known archaeological sites or historic structures were identified during the archival research or the fieldwork phase of this project. In the unlikely event that cultural resources are

uncovered during construction, work in the immediate vicinity of the project would be halted, and BPA would consult with the Oregon State Historic Preservation Officer and a qualified archaeologist.

3.12 Public Health and Safety

3.12.1 Exposure to Electric and Magnetic Fields

Everything electrical, including power lines, household wiring and appliances, produce electric and magnetic fields (EMF). Movement of electrons in a wire (**current**) produces magnetic fields, and electrical pressure (voltage) produces electric fields. Field strength decreases rapidly with distance.

EMF are found around any electrical wiring, including household wiring and electrical appliances and equipment. Throughout a home, the electric-field strength from wiring and appliances is typically less than 0.01 kilovolts per meter (kV/m). However, fields of 0.1 kV/m and higher can be found very close to some electrical appliances such as electric blankets.

Average magnetic-field strength in most homes (away from electrical appliances and home wiring, etc.) is less than 2 **milligauss** (**mG**). Very close to appliances carrying high current, fields of tens or hundreds of milligauss can be present. Unlike electric fields, magnetic fields from outside power lines are not reduced in strength by trees and building materials. So, transmission or distribution lines can be a major source of magnetic-field exposure throughout a home located close to the line.

3.12.1.1 Transmission Lines

Magnetic fields within transmission-line corridors constantly increase and decrease for a variety of reasons. If electric loads on a line increase, magnetic fields also increase. Magnetic fields are typically greatest in winter months, when electrical demands are highest. Operational, meteorological, and line design factors also affect magnetic fields. Fields are higher when the line is physically lower (closer to the ground) either because of design or because of higher temperatures. Since the voltage on transmission lines is relatively constant, the electric-field strength is dependent primarily on height above ground and is more constant than magnetic-field strength. Thus, predicting exact electric- and magnetic-field strengths involves uncertainty. Nevertheless, it is possible to estimate EMF for specific transmission-line conditions (maximum voltage, maximum load, and minimum height) that place upper limits on the field strengths that will actually be found under specific lines.

Information about EMF levels for the existing and proposed transmission lines in the project area are in Appendix A. Appendix A also describes how levels are determined.

3.12.1.2 Regulations and Guidelines

There are no national standards for EMF from power facilities such as transmission lines. Oregon Energy Facility Siting Council (Oregon EFSC) has an electric field standard of 9 kV/m within the ROW. BPA has also set a maximum allowable electric field of 5 kV/m at the edge of

its rights-of-way and at road crossings. Additionally, BPA has set maximum allowable electric field strengths of 3.5 kV/m and 2.5 kV/m at shopping center parking lots and commercial/industrial lots, respectively. These levels are set to eliminate nuisance shocks. The Proposed Action would meet both Oregon's and BPA's electric field standards.

More information about standards is in Appendix A.

3.12.2 Electric and Magnetic Field Effects

Power lines, like electrical wiring, can cause serious electric shocks if certain precautions are not taken. These precautions include building the lines to minimize shock hazard. All BPA lines are designed and constructed in accordance with the National Electrical Safety Code (***NESC***). NESC specifies the minimum allowable distances between the lines and the ground or other objects. These requirements basically determine the edge of the ROW and the height of the line, that is, the closest point that houses, other buildings, and vehicles are allowed to the line.

People must also take certain precautions when working or playing near power lines. It is extremely important that a person not bring anything, such as a TV antenna or irrigation pipe, too close to the lines. The BPA provides a free booklet that describes safety precautions for people who live or work near transmission lines (Living and Working Safely Around High-Voltage Power Lines).

Possible effects associated with the interaction of EMF from transmission lines with people on and near a ROW fall into two categories: short-term effects that can be perceived and may represent a nuisance, and possible long-term health effects. Short and long-term effects of the Proposed Action are discussed in detail in Appendix A.

The issue of whether there are long-term health effects associated with transmission-line fields is controversial. In recent years, considerable research on possible biological effects of EMF has been conducted. A review of these studies and their implications for health-related effects is provided in Appendix B. Also, the Department of Energy (DOE) provides a free booklet that describes safety precautions for people who live or work near transmission lines (Questions and Answers about EMF Electric and Magnetic Fields Associated with the Use of Electric Power).

There are no national standards for electric or magnetic fields. The proposed project would meet BPA's and Oregon's electric field standard.

Predicted levels for electric and magnetic fields were calculated for the Proposed Action. Appendix A describes how the calculations were done and the predicted values in more detail.

3.12.2.1 Calculated Values for Electric Fields

The calculated peak electric field expected on the ROW of the proposed line is 2.5 kV/m when there are no parallel lines. The peak values would be present only at locations directly under the line, near mid-span, where the conductors are at the minimum clearance. The conditions of minimum conductor clearance at maximum current and maximum voltage occur very infrequently. The calculated peak levels are rarely reached under real-life conditions, because the actual line height is generally above the minimum value used in the computer model,

because the actual voltage is below the maximum value used in the model, and because vegetation within and near the edge of the ROW tends to shield the field at ground level. Maximum electric field under the existing parallel McNary-Santiam 500-kV line is 8.1 kV/m.

The largest values expected at the edge of the ROW nearest the proposed line would be 0.4 kV/m. For the parallel configuration, the field at the edge of the ROW nearest the 500-kV line would be 0.3 kV/m. The largest electric fields at the edges of the existing rights-of-way are 1.3 and 2.6 kV/m for the 230- and 500-kV lines, respectively.

The electric fields associated with the Santiam-Bethel line can be compared with those found in other environments. Sources of 60-Hertz (Hz) electric (and magnetic) fields exist everywhere electricity is used; levels of these fields in the modern environment vary over a wide range. See Appendix A for more detail.

3.12.2.2 Calculated Values for Magnetic Fields

Field values on the ROW and at the edge of the ROW were calculated for the projected maximum currents during winter peak load in 2006, for minimum and average conductor clearances. The actual magnetic-field levels would vary as currents on the lines change daily and seasonally and as ambient temperature changes. Average currents over the year would be about 60 percent of the maximum values. The levels represent the highest magnetic fields expected for the proposed Santiam-Bethel/Santiam-Chemawa 230-kV line. Average fields over a year would be considerably reduced from the peak values as a result of increased clearances above the minimum value and reduced currents from the maximum value.

The maximum calculated 60-Hz magnetic field expected at 3.28 ft. (1 m) above ground for the proposed line is 87 mG for the proposed line alone and 94 mG when the line parallels the 500-kV line. This field is calculated with the conductors at a minimum height of 31 ft. (9.5 m). The maximum field would decrease for increased conductor clearance. For an average conductor height over a span of 43 ft. (13.1 m), the maximum field would be 50 mG and 58 mG for the proposed line alone and parallel to the 500-kV line, respectively.

At the edge of the ROW of the proposed line, the calculated magnetic field for maximum current load conditions is 26 mG. When the line is located parallel to the existing 500-kV line, the field at the edge of the ROW adjacent to the proposed line would be 29 mG.

The magnetic field falls off rapidly as distance from the line increases. At a distance of 200 ft. from the centerline of the proposed line, the field would be 4 mG for maximum current conditions. The calculated magnetic field for maximum current would be less than 10 mG at about 120 ft. from the centerline. For the existing lines, the peak magnetic fields on the rights-of-way are 218 mG and 108 mG, for the 230- and 500-kV lines, respectively. Fields at the edges of the existing rights-of-way are 78 mG and 50 mG for the 230- and 500-kV lines, respectively. Addition of the proposed line would not greatly change the magnetic fields under, or at the edge of, the ROW of the existing 500-kV line.

The magnetic fields associated with the proposed Santiam-Bethel 230-kV line can be compared with fields from other sources. The range of 60-Hz magnetic-field exposures in publicly accessible locations such as open spaces, transmission-line rights-of-way, streets, pedestrian walkways, parks, shopping malls, parking lots, shops, hotels, public transportation, and so on range from less than 0.1 mG to about 1 G, with the highest values occurring near small

appliances with electric motors. In occupational settings in electric utilities, where high currents are present, magnetic-field exposures for workers can be above 1 G. At 60 Hz, the magnitude of the natural magnetic field is approximately 0.0005 mG. See Appendix A for more detail.

3.12.3 Noise and Radio/Television Interference

3.12.3.1 Audible Noise

Noise impacts result from construction activities and from the operation of the transmission facilities. Construction noise is short-term and typically does not result in any serious disturbance to residents.

Noise produced by transmission line **corona** is a hissing, popping or crackling sound. It is primarily associated with lines of 345-kV and above. A 120-Hz "hum" is also occasionally superimposed on the corona-generated noise. The sound level depends on the ambient noise level, conductor and structure geometry, operating voltage, and the weather. Audible noise from transmission lines increases in wet weather.

The Noise Control Act of 1972 gives the states the responsibility for noise control. Environmental noise limits applicable to this project are regulated by Oregon Administrative Rules (OAR 340.35). Corona-generated audible noise from the proposed line would be similar to noise from the existing 230-kV line and less than that from the existing 500-kV transmission lines. Audible noise levels would be in compliance with noise regulation in Oregon.

BPA may use implosive fittings to connect one reel of conductor to another. These explosive devices are set off causing the fitting to tighten around the conductors. This provides a very solid connection. A temporary loud boom can be heard when the fittings explode. BPA would notify nearby landowners if these fittings are going to be used on the project.

3.12.3.2 Radio and Television Interference

Corona occurs where high electric field strength on conductors, insulators, and hardware imparts sufficient energy to charged particles to cause ionization (molecular breakdown) of the air. Corona may interfere with radio and television reception by generating a high-frequency noise called electromagnetic interference (EMI). EMI is a static sometimes heard over an automobile radio when driving beneath high-voltage lines. It is usually associated with higher voltage lines, i.e., 345-kV and above. Corona activity also produces audible noise. (See **Audible Noise** above.)

Federal Communications Commission (FCC) regulations require that incidental radiation devices (such as transmission lines) be operated so that radio and television reception will not be seriously degraded or repeatedly interrupted. Further, FCC regulations require that the operators of these devices mitigate such interference. Corona-generated EMI from the proposed line would be less than that from the existing 230-kV line on the corridor and would remain below limits identified as acceptable. Overall, BPA receives very few radio interference (RI) or television interference (TVI) complaints. None are anticipated for this project. BPA will mitigate those instances where an engineering study has determined that harmful interference exists as a result of BPA's facilities.

3.12.4 Fire

Fires on or near the ROW can jeopardize safe and reliable operation of transmission lines. Besides physical damage from heat and flames, smoke and hot gases from a fire can cause arcing between lines, between lines and structures, or between lines and the ground. Such occurrences can pose a threat to the safety of personnel in the vicinity, such as firefighters, and can result in line outages.

To prevent fires and other hazards, safe clearances are maintained between the tops of trees and the existing lines. Electricity can arc from the conductor to a treetop. Generally, trees are not allowed to grow over 20 feet high on the ROW. Trees and tall brush are removed periodically from the ROW as part of maintenance activities. BPA also prohibits storage of flammable material on rights-of-way.

Transmission structures may be struck by lightning. Because the structures are electrically grounded, the current from the lightning strike passes directly into the ground with minimal risk of starting a fire.

Because the proposed project would rebuild an existing transmission line on the same ROW, no new fire hazards or risks are expected to occur beyond those already present from the current transmission line.

3.12.5 Potential Impacts of the No Action Alternative

No impacts are expected to occur to public health and safety beyond those already taking place from the existing line.

3.12.6 Mitigation for the Proposed Action

Mitigation actions to protect public health and safety include:

- Design the Proposed Action to meet Oregon EFSC and BPA electric field standards.
- Maintain safe clearances between trees and transmission lines to prevent fires and other hazards.
- Ground all transmission structures to minimize fire risk.
- Require the construction contractor to develop an emergency response plan that includes responding to a potential accidental fire during construction.
- Design the line to meet Oregon EFSC requirements for noise where the line is parallel to existing 500-kV lines.
- Rectify any TV/radio interference caused by the proposed project.